

CLAIMS

What is claimed is:

1. A method comprising:
preprocessing a video image from a video camera to separate one or more objects to be tracked from the rest of the video image and compute statistics for the one or more objects to be tracked and the rest of the video image;
generating a quality measure based on the statistics for the one or more objects to be tracked and the rest of the video image that indicates the suitability of the video image for use by an object tracking system; and
tuning said video camera to increase said quality measure beyond a threshold.
2. The method of claim 1, wherein said preprocessing comprises:
computing color statistics for said one or more objects to be tracked;
removing said one or more objects to be tracked from a background of the video image; and
computing color statistics for said background of the video image.
3. The method of claim 2, wherein said computing color statistics for said one or more objects to be tracked comprises:
identifying the objects to be tracked; and
calculating mean and variance values for the hue and saturation of the one or more objects to be tracked.

1 4. The method of claim 3, wherein said identifying comprises aligning the at least one or more
2 objects to be tracked with one or more rectangles projected onto the video image.

1 5. The method of claim 2, wherein said removing said one or more objects to be tracked from a
2 background of the video image comprises:

3 selecting one object of the one or more objects to be tracked;

4 selecting a pixel within the selected object;

identifying the selected pixel as a pixel belonging to the selected object if the difference

between hue of the pixel and mean hue of the selected object is within an allowable
range for hue, the difference between saturation of the pixel and mean saturation of
the selected object is within an allowable range for saturation, and the horizontal and
vertical distances of the pixel from the center of the selected object are within an
allowable range for distance; and

identifying a pixel as belonging to the background of the video image if the difference

between hue of the pixel and the mean hue of the selected object is not within said
allowable range for hue, the difference between saturation of the pixel and the mean
saturation of the object selected is not within said allowable range for saturation, and
the horizontal and vertical distances of the pixel from the center of the selected object
are not within said allowable range for distance.

1 6. The method of claim 5, wherein said allowable range for hue is ten times the square root of
2 hue variance.

- 1 7. The method of claim 5, wherein said allowable range for saturation is ten times the square
2 root of saturation variance.
- 1 8. The method of claim 5, wherein said allowable range for distance is ten percent of the
2 maximum width or height.
- 1 9. The method of claim 2, wherein said computing color statistics for said background of the
2 video image comprises:
3 calculating a mean value for hue of the background; and
4 calculating a mean value for saturation of the background.
- 1 10. The method of claim 1, wherein said generating a quality measure comprises:
2 maximizing the saturation of each of the one or more objects to be tracked;
3 minimizing the saturation of the background of the video image;
4 maximizing the hue difference between the one or more objects to be tracked; and
5 maximizing the average hue difference between the one or more objects to be tracked and the
6 background of the video image.
- 1 11. A system comprising:
2 a storage device having stored therein one or more routines for determining the suitability of
3 a video image for use by an object tracking system; and
4 a processor coupled to the storage device that when executing the one or more routines:

preprocesses a video image from a video camera to separate one or more objects to be tracked from the rest of the video image and compute statistics for the one or more objects to be tracked and the rest of the video image; generates a quality measure based on the statistics for the one or more objects to be tracked and the rest of the video image that indicates the suitability of the video image for use by an object tracking system; and tunes said video camera to increase said quality measure beyond a threshold.

12. The system of claim 11, wherein preprocessing comprises:

computing color statistics for said one or more objects to be tracked; removing said one or more objects to be tracked from a background of the video image; and computing color statistics for said background of the video image.

13. The system of claim 12, wherein said computing color statistics for said one or more objects to be tracked comprises:

identifying the objects to be tracked; and calculating mean and variance values for the hue and saturation of the one or more objects to be tracked.

14. The system of claim 13, wherein said identifying comprises aligning the at least one or more objects to be tracked with one or more rectangles projected onto the video image.

15. The system of claim 12, wherein said removing said one or more objects to be tracked from a background of the video image comprises:

3 selecting one object of the one or more objects to be tracked;
4 selecting a pixel within the selected object;
5 identifying the selected pixel as a pixel belonging to the selected object if the difference
6 between hue of the pixel and mean hue of the selected object is within an allowable
7 range for hue, the difference between saturation of the pixel and mean saturation of
8 the selected object is within an allowable range for saturation, and the horizontal and
9 vertical distances of the pixel from the center of the selected object are within an
10 allowable range for distance; and
11 identifying a pixel as belonging to the background of the video image if the difference
12 between hue of the pixel and the mean hue of the selected object is not within said
13 allowable range for hue, the difference between saturation of the pixel and the mean
14 saturation of the object selected is not within said allowable range for saturation, and
15 the horizontal and vertical distances of the pixel from the center of the selected object
16 are not within said allowable range for distance.

1 16. The system of claim 15, wherein said allowable range for hue is ten times the square root of
2 hue variance.

1 17. The system of claim 15, wherein said allowable range for saturation is ten times the square
2 root of saturation variance.

1 18. The system of claim 15, wherein said allowable range for distance is ten percent of the
2 maximum width or height.

1 19. The system of claim 12, wherein said computing color statistics for said background of the
2 video image comprises:

3 calculating a mean value for hue of the background; and

4 calculating a mean value for saturation of the background.

1 20. The system of claim 11, wherein said generating a quality measure comprises:

2 maximizing the saturation of each of the one or more objects to be tracked;

3 minimizing the saturation of the background of the video image;

4 maximizing the hue difference between the one or more objects to be tracked; and

5 maximizing the average hue difference between the one or more objects to be tracked and the
6 background of the video image.

7 21. A machine-readable medium having stored thereon data representing sequences of
8 instructions, said sequences of instructions which, when executed by a processor, cause said
9 processor to:

10 preprocess a video image from a video camera to separate one or more objects to be tracked
1 from the rest of the video image and compute statistics for the one or more objects to
2 be tracked and the rest of the video image;

3 generate a quality measure based on the statistics for the one or more objects to be tracked

4 and the rest of the video image that indicates the suitability of the video image for use

5 by an object tracking system; and

6 tune said video camera to increase said quality measure beyond a threshold.

- 1 22. The machine-readable medium of claim 21, wherein preprocessing comprises:
2 computing color statistics for said one or more objects to be tracked;
3 removing said one or more objects to be tracked from a background of the video image; and
4 computing color statistics for said background of the video image.
- 1 23. The machine-readable medium of claim 22, wherein said computing color statistics for said
2 one or more objects to be tracked comprises:
3 identifying the objects to be tracked; and
4 calculating mean and variance values for the hue and saturation of the one or more objects to
5 be tracked.
- 1 24. The machine-readable medium of claim 23, wherein said identifying comprises aligning the
2 at least one or more objects to be tracked with one or more rectangles projected onto the
3 video image.
- 1 25. The machine-readable medium of claim 22, wherein said removing said one or more objects
2 to be tracked from a background of the video image comprises:
3 selecting one object of the one or more objects to be tracked;
4 selecting a pixel within the selected object;
5 identifying the selected pixel as a pixel belonging to the selected object if the difference
6 between hue of the pixel and mean hue of the selected object is within an allowable
7 range for hue, the difference between saturation of the pixel and mean saturation of
8 the selected object is within an allowable range for saturation, and the horizontal and

vertical distances of the pixel from the center of the selected object are within an allowable range for distance; and identifying a pixel as belonging to the background of the video image if the difference between hue of the pixel and the mean hue of the selected object is not within said allowable range for hue, the difference between saturation of the pixel and the mean saturation of the object selected is not within said allowable range for saturation, and the horizontal and vertical distances of the pixel from the center of the selected object are not within said allowable range for distance.

26. The machine-readable medium of claim 25, wherein said allowable range for hue is ten times the square root of hue variance.

27. The machine-readable medium of claim 25, wherein said allowable range for saturation is ten times the square root of saturation variance.

28. The machine-readable medium of claim 25, wherein said allowable range for distance is ten percent of the maximum width or height.

29. The machine-readable medium of claim 22, wherein said computing color statistics for said background of the video image comprises:
calculating a mean value for hue of the background; and
calculating a mean value for saturation of the background.

1 30. The machine-readable medium of claim 21, wherein said generating a quality measure
2 comprises:
3 maximizing the saturation of each of the one or more objects to be tracked;
4 minimizing the saturation of the background of the video image;
5 maximizing the hue difference between the one or more objects to be tracked; and
6 maximizing the average hue difference between the one or more objects to be tracked and the
7 background of the video image.